Art. I.—*On the Occurrence of the Anchoring Tubes of Adeona in the Older Tertiaries of Victoria with an Account of their Structure.*

(Plate I.).

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In the residue obtained from washing samples of the older Tertiary marine clays of various parts of Victoria, there occur numerous small cylindrical calcareous bodies, the nature of which has long been a puzzle to those who have examined them. Recently, while examining some specimens of *Adeona* in the collection of the late Dr. MacGillivray, in which the anchoring tubes were well preserved, the resemblance of the joints of the anchoring tubes of the polyzoon to the objects in question struck me very forcibly, and a dried specimen in the collection of the Biological School afforded sufficient material for making a careful comparison with the fossil forms.

The fossils are very variable in size and shape, but speaking generally they are cylindrical objects ranging up to about 3 mm. or 4 mm. in diameter and to about 5 mm. in length. The two terminal plane faces of the cylinder are generally perpendicular to its long axis, and are pierced by a number of fine pores, which are apparent without the aid of a lens. The lateral wall of the cylinder is formed by closely applied threadlike cords which branch and anastomose, leaving narrow elongated pores between them, the long axis of the pores coinciding in direction with that of the cylinder. Usually the diameter of the cylinder slightly increases somewhat suddenly at each end. In many cases the joints are branched, three branches sometimes meeting at one point. The proportion of the length of the cylinder to its diameter varies greatly in different specimens. Some are very elongate, while others are flat discs, all grades between the two extremes being found.

A transverse section shows a cylindrical canal occupying the organic centre and a series of canals, which are somewhat reniform in transverse section, arranged round this in several concentric circles. The canals are connected with those on the same radius by very fine tubules, connection of one canal with another beside it occurring rarely in the sections I have examined. The whole structure has therefore very much the appearance of an Haversian system of a mammalian bone, but the central canal is smaller and the fine tubules corresponding to the canaliculi are far fewer and coarser than in bone.

In longitudinal section the canals are seen as parallel tubes, and the connecting tubules, which are far apart, run, as a rule, somewhat obliquely from one canal to another. In one instance a "tabula" crossing a large canal was clearly seen.

A longitudinal section through the point where branching takes place shows that the central canal itself divides into two, a division running up the axial line of each branch. The fine tubules occasionally pierce the outer wall of the cylinder and their openings form the slitlike pores before mentioned. Some of the specimens of which I have made sections are infiltrated with iron pyrites, which has filled even the fine tubules, and the structure is thus more clearly shown than in those specimens where no infiltration has taken place.

In the recent condition the members of the genus, as restricted by MacGillivray, are fixed to foreign bodies by a flexible organ of attachment, which is built up of alternate calcareous and chitinous portions resembling, as Lamouroux remarks, the stem of *Isis*. The rooting apparatus is very variable in form and in the amount which is in contact with the usually pointed stalk (*stiel* of Kirchenpauer). Near its origin the calcareous portions are disc-like, but towards its distal portion become more elongate, and the rooting organ breaks up into cylindrical jointed twigs which branch copiously and frequently anastomose. Branching always takes place from the calcareous segments. The latter vary very much in length. The ultimate ramifications consist of a single hairlike tube which becomes firmly attached to a foreign body such as a rock or fragment of a molluscan shell, and in which the alternations of calcareous and chitinous segments is clearly visible, and in which branching and anastomosis also occur.

An examination of incinerated fragments and of a number of sections of the anchoring tubes of a dried, recent specimen shows that their structure is identical with that just described in the fossil. Each branch of the "root," in short, is a bundle of tubes arranged in several concentric circles. In the calcareous segments these tubes communicate with one another by fine connecting tubules, which do not apparently occur in the chitinous segments, where the tubes remain distinct and separate from one another.

The chitinous tubes are continued as a lining for a variable distance into the canals of the calcarous segments, and occasionally chitin may be traced into the connecting tubules. Judging by Kirchenpauer's description and figure he appears to have not noticed the larger canals in the calcareous segments, but to have seen the smaller ones only.* The structure of the rooting organ would be then, as he remarks, entirely different from that of any other genus of Cheilostomata, as in all other instances it consists of a chitinous tube more or less encrusted with calcareous matter. It will, however, be seen that the differences are not as great as he thought, though the alternation of calcareous and chitinous joints still marks it off strongly from the attaching structure of all other polyzoa.

Nicholson† figures the central portion of a transverse section of the zoarium of a recent *Cellepora* which shows practically the same structure as is seen in the rooting "organ" of Adeona. Sections which I have made of *Cellepora incrassata* from the Kara sea show that towards the centre of the older portion of a branch the zoœcia have assumed an elongate tube-like form, and the communication tubes have the appearance described by Nicholson. In the younger parts of a branch, that is towards its distal end, the structure is very like that shown in Nicholson's fig. 452, C. The modifications of the skeleton have their parallel in those of the zooids which build up its different parts, and the polymorphic character of the polyzoon colony has long been recognised.

The genus *Adeona* is restricted to the southern seas, several species having been recorded from Australia and South Africa.

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* Ueber die Bryozoen-Gattung Adeona.

† Manual of Palæontology, Nicholson and Lydekker, 3rd ed., vol. i., p. 607.

In our own seas it is rather a rare form, and is usually, I believe, dredged from a depth of about twenty fathoms.

It is noted as a common characteristic genus in our older Tertiaries by Dr. MacGillivray in his "Monograph of the Victorian Tertiary Polyzoa."

In common with several other geologists I regard the beds from which Dr. MacGillivray's Tertiary Polyzoa came, and from which I obtained these specimens, as of Eocene age.

The localities at which I have found examples are Mornington; Mouth of Duck Ponds Creek, Corio Bay (bore); Campbell's Point; Belmont (well sinking); Birregurra; Southern Moorabool Valley; Shelford; Muddy Creek.

EXPLANATION OF PLATE.

The Figures are all drawn from Fossil Specimens.

Figs. 1, 2, 3, 4.—Calcareous joints of Anchoring Tubes of *Adeona*. Enlarged.

Fig. 5.—Portion of external surface of same, showing corded nature of the surface and openings of pores.

Fig. 6.—Transverse section of same, infiltrated with pyrites. × 22.

Fig. 7.—Portion of 6 more highly magnified.

Fig. 8.—Longitudinal section showing bifurcation of central canal at point where branch is given off. × 22.

(Figs. 6, 7, 8, drawn under the camera lucida).